PROC. ENTOMOL. SOC. WASH.
81(4), 1979, pp. 630–639

PREDATORY BEHAVIOR AND PREY OF *ATOMOSIA PUELLA* (DIPTERA: ASILIDAE)

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Abstract.—A field study of the predatory behavior and prey of *Atomosia puella* (Wiedemann) is reported. General predatory behavior is discussed and compared with a related species, *Cerotainia albipilosa* Curran. Prey are analyzed and discussed with regard to prey sizes, proportion of major taxa in the diet, and the impact of the localized concentration of species that influence selectivity.

Members of the asilid genus *Atomosia* are primarily found in the Neotropical Region, although four species are known from the Nearctic and one from the Oriental (Hull, 1962). *Atomosia puella* (Wiedemann), the subject of this paper, occurs in the Nearctic Region along the Atlantic seaboard from Connecticut to Florida and inland to Ohio and Texas (Bromley, 1946; Martin and Wilcox, 1965). This asilid is recognized by a small dark robust body, a converging vertex, a strongly and coursely punctate abdomen, and genitalia which are concealed in a cuplike 6th tergum (Hull, 1962). It can be separated from other species of *Atomosia* by four scutellar bristles, black tibiae, and black-haired apical tarsal segments (Bromley, 1946). This species is similar in behavior and appearance to *Cerotainia albipilosa* Curran (Scarbrough, 1978) but can be separated by the convergent vertex (Hull, 1962). Both genera belong to the tribe Atomosini (Hull, 1962), and the two species sometimes occur together in the same locality (Scarbrough, 1974). This study represents the first behavioral report on a species of the genus *Atomosia*. A second paper will follow covering the diurnal activity rhythm and courtship behavior of *A. puella*.

Study Site and Methods

This study was conducted during June and July 1977 and 1978 on a farm located near Bonita Avenue, about 3.3 km NW of Owens Mills, Baltimore County, Maryland. Individuals of *A. puella* were censused 10 times hourly between 0700 and 1400 h EST under sunlit conditions along a study route of about 400 m. The route was sufficiently long so that the area was sampled only once per hour and allowed the flies sufficient time to resume normal activities. During each census flies were recorded as feeding on prey or involved in other behaviors. Prey were collected by capturing the feeding asilid in a 15 dram snap top plastic vial and releasing it only after the prey was dropped. Prey were later identified and measured from the front of the head to the tip of the abdomen for body length. Altogether, 64 predators were captured, sexed, and measured for length. Observations also were made on predation on occasions other than during the censuses.

Predatory Behavior

Atomosia puella foraged under bright skies from shaded or sunlit perches and at air temperatures above 18°C. The asilid sometimes foraged from horizontal substrates but usually selected vertical ones, perching in a head-downwards position with its head elevated at an angle of 30–40° to the substrate. Most flies (83%, N = 100) perched just above the upper surfaces of the vegetation covering the ground and oriented their heads toward an open area and a bright sky. This position apparently enhances the flies' ability to detect moving objects as they are backlighted against a bright sky (Dennis and Lavigne, 1975; Scarbrough, 1978).

When perched, *A. puella* was relatively motionless, showing little or no response toward passing prey. Occasional wing flutters and abdominal and/or body elevations were the only movements observed. However, these movements are not believed to be in response to passing prey since they also occurred when prey were absent. It is more probable that they are associated with the predator adjusting its field of vision in search of prey and/or a technique used for cooling its body when perched on a hot substrate. Head movements and pivoting movements, like those described for *C. albipilosa* Curran (Scarbrough, 1978), were not observed.

General predatory behaviors (e.g., flight patterns, prey capture and immobilizations, sites of inserting the hypopharynx, and location of feeding sites) of *A. puella* are essentially identical to those described for *C. albipilosa* (Scarbrough, 1978). Its behavior differs in that forage flights were directed at prey at shorter distances (range 8 cm–1.5 m), with most captures occurring within 75 cm (89%, N = 652 captures) of the perch, and a larger proportion of flights were successful (29%, N = 2817 flights).

Cerotainia albipilosa manipulated most prey while hovering near a perch (Scarbrough, 1978). In contrast, *A. puella* usually manipulated prey when perched. It disengaged the prey with the front tarsi and re-inserted the hypopharynx at a new location. In some instances prey were "spun" while they were still impaled on the hypopharynx. The front tarsi were used to force the prey into a new position. Large hard bodied prey such as *Ponera* sp. (>3.5 mm) were sometimes manipulated while the asilid hovered in front of its perch. Unless the asilid was disturbed, feeding was completed during a single perch; and the prey was removed with a front tarsus before or at the time of another forage flight. Most asilid species use both tarsi to disengage prey.

The length of individual feedings was correlated with body size and weather conditions. The average feeding time of all prey was 4.2 min (N = 312) but ranged from 1 to 71 min. Aphids and other small prey (1.5–2.5 mm) with bulbous or linear bodies were fed upon for an average of 1.7 min (range 0.7–8.5, N = 150) under sunlit skies and air temperatures above 26°C. Larger prey such as termites ($\bar{x}$ = 4.81 mm, N = 14) were fed upon for an average of 38 min under similar conditions. Feeding rates increased markedly during overcast periods. One female fed on an aphid for 26 min, and another fed on a reproductive ant (*Ponera pennsylvanica* Buckley, 5.0 mm) for 71 min.

Table 1 shows types and sizes of prey taken by *A. puella*. Species of the orders Diptera, Hymenoptera, and Hemiptera-Homoptera were the most important prey items, with Diptera dominant and accounting for over 49% of the diet. Most prey belonged to a limited number of subgroups within these orders (e.g., Nematocera Diptera, small Apocrita Hymenoptera and the Hemiptera-Homoptera families Aphididae, Cicadellidae, and Miridae) and accounted for over 70% of the total diet. Eleven specimens of thrips and four of Strepsiptera were also included among the prey. Thrips have been reported as prey of *Holopogon wilcoxi* Martin (Hespenheide and Rubke, 1977), *Nannocyrtopogon neoculatus* Wilcox and Martin (Hespenheide, 1978) and *C. albipilosa* (Scarbrough, 1978). The latter species has also been reported to take Strepsiptera.

Prey Selection

The major prey groups reported for *A. puella* are very similar to those reported for species of *Holopogon* (Dennis and Lavigne, 1975; Hespenheide and Rubke, 1977), *Nannocyrtopogon* (Hespenheide, 1978), *Cerotainia* (Scarbrough, 1978), and *Asilus* and *Proctacanthella* (Dennis and Lavigne, 1975). As in the diet of *A. puella*, dipterous species formed the dominant component (37%) of the diet of *C. albipilosa* (Scarbrough, 1978). In contrast, species of Hemiptera-Homoptera were dominant in the other species of asilids, and accounted for over 40% of their diets (Hespenheide, 1978).

Mean size of all prey was 2.9 mm, with over 89% between 1 and 4 mm (Table 1). Females were significantly larger ($P < .001$, Student's t-Test) than males and took slightly larger prey ($\bar{x}$ = 3.03 ♀♀, 2.81 ♂♂; $P < .05$), although both sexes took prey in all class sizes. Predator-prey ratios for the sexes were 2.23 and 2.13 for females and males, respectively. Between prey orders, specimens of Isoptera were significantly larger ($P < .001$; Newman-Keuls multiple range test) than all others, while Hymenoptera and Hemip-

Table 1. Prey of *Atomosia puella* in Maryland.

Taxa	Number	Percent	Measured	Mean[1]	SD	Range
Diptera	769	49.1	742	2.35	1.01	0.64–6.39
Nematocera	509	66.2	490	2.19	0.99	0.64–6.01
Others	260	33.8	254	2.49	1.01	0.99–6.33
Hemiptera-Homoptera	424	27.1	393	2.66	1.05	1.12–5.15
Aphididae	196	46.2	190	1.82	0.40	1.25–2.75
Cicadellidae	113	26.7	113	3.95	1.01	3.13–6.25
Miridae	82	19.3	82	3.61	0.70	2.50–5.00
Others	33	7.8	33	1.34	1.03	1.12–5.01
Hymenoptera	197	12.6	186	2.70	0.85	1.36–4.91
Coleoptera	66	4.2	66	2.44	0.70	1.06–4.51
Isoptera	72	4.6	72	4.81	0.64	3.61–6.06
Miscellaneous	39	2.4	39	2.45	0.97	1.03–3.53
Total	1567	100.0	1498	2.90	0.87	0.64–6.39

[1] Means compared by Newman-Keuls multiple range test: ♂♂ $\bar{x} = 5.98 \pm 0.35$, range 5.42–6.55; ♀♀ $\bar{x} = 6.76 \pm 0.41$, range 6.06–7.79.

tera-Homoptera were significantly larger ($P < .001$) among the remaining prey. Within prey taxa, Nematocera Diptera were smaller ($P < .001$) than other Diptera, whereas both cicadellids and mirids were larger ($P < .001$) than the remaining Hemiptera-Homoptera.

Other studies (Melin, 1923; Dennis and Lavigne, 1975; Scarbrough, 1978) have suggested that cuticular hardness and flight characteristics of prey are significant factors influencing selectivity in asilids. This study supports these suggestions. Diptera, Hemiptera-Homoptera excluding Cicadellidae, and Isoptera (*Reticulitermes flavipes* (Kollar)) have thin or soft cuticle and poor flight ability and formed over 68% of the diet. The asilid usually inserted its hypopharynx in the dorsum of the thorax of the aforementioned prey. Among the remaining prey, the hypopharynx was inserted in specialized areas of the body which had soft or thin cuticle; e.g., intersegmental membranes and compound eyes of Hymenoptera and below the wings on the dorsal surface of the abdomen of cicadellids and Coleoptera. In the latter prey, the wings had been held in a flight position, which exposes the underlying soft cuticles, where the hypopharynx was inserted.

Figure 1 shows mean prey sizes and proportion of prey types per hour sampled. The size of prey per sample period was variable, with the smallest prey found at 0700 h and the largest at 1200 h. The former was related to an abundance of small Diptera ($\bar{x} = 2.14$, N = 113) in the sample, and the latter to a termite ($\bar{x} = 4.81$, N = 35) swarm which occurred on one day of the study. When termites are removed from the 1100, 1200 and 1300 h prey

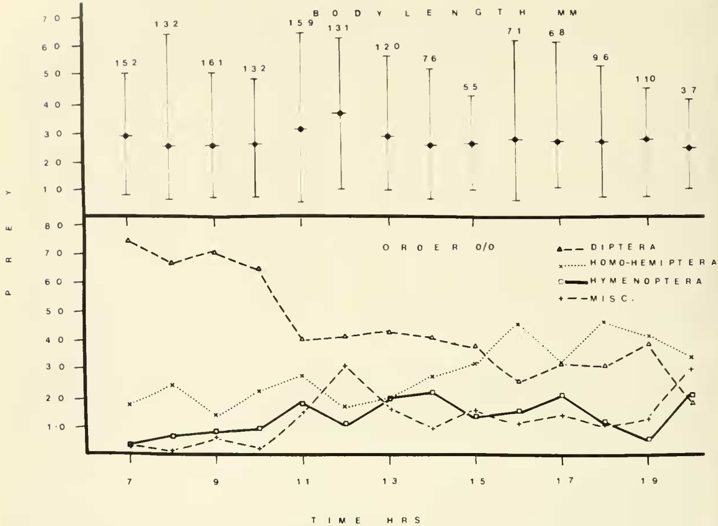

Fig. 1. Mean prey size and proportion of prey types taken per hour of the day. Vertical lines represent ranges, mid-points represent means, and numbers above each hour represent sample sizes.

samples, means are reduced from 2.95, 3.30 and 2.76 to 2.57, 2.69 and 2.55, respectively, and are more consistent with the remaining census periods. However, no significant difference ($P \sim .1$: Newman-Keuls multiple range test) was found between mean prey size per hour sampled.

The proportion of prey types in the diet of *A. puella* changed significantly ($P < .001$) during the day (Fig. 1). Dipterous species were dominant (>82%) during most of the day, although they decreased significantly ($P < .001$) after 1000 h. The remaining prey formed smaller proportions of the diet during most of the day but showed temporary increases (miscellaneous prey, $P < .001$) or gradual increases in mid to late afternoon (Hymenoptera, $P > .05$; Hemiptera-Homoptera, $P < .001$).

An analysis of major taxa, using a 2 × 7 contingency table to compare two 7-hour periods of the day, revealed that only Hymenoptera, cicadellids, and mirids showed no significant differences in proportions between the two halves of the day (Table 2). Aphids were captured in slightly greater numbers (52.9%; N = 90) in the second half of the day. Both groups of Diptera showed significant differences between the two halves of the day, and

Table 2. Comparison of major prey taxa during two 7 hour periods (700–1300 vs. 1400–2000 h) of the day.

Prey	Total	χ^2	Sign. Level
Diptera	742	60.14	.001
Nematocera	553	56.33	.001
Non-nematocera	229	45.41	.001
Hemiptera-Homoptera	393	20.03	$.01 > P > .001$
Aphididae	170	22.05	$.01 > P > .001$
Cicadellidae	120	5.35	N.S.
Miridae	78	13.34	N.S.
Hymenoptera	180	14.64	N.S.
Miscellaneous	180	23.14	.001

formed 76.4% of the dipterous prey during the first half with the remaining during the second half of the day. However, nematocerous species formed 71.4% of all dipterous prey with 54.0 and 16.6% being captured in the first and second halves of the day, respectively. Non-nematoceran Diptera formed 20.6 and 8.0% of the dipterous prey during the two halves of the day, respectively.

The appearance of large numbers of specific taxa in the prey sample at certain periods of the day can be attributed to differential activity patterns of those prey taxa. Restriction of an activity pattern, or some aspect of it, in time and space can produce temporary localized concentrations of potential prey species. Other investigators (Bromley, 1934, 1946, 1949; Linsley, 1944, 1972; Dennis and Lavigne, 1975; Knutson, 1978; Scarbrough, 1979) have shown indirectly that when such concentrations exist, some asilid species will exploit them.

Although no attempt was made to determine potential prey densities, localized concentrations of some prey taxa were evident at certain times; e.g., swarms of termites, mating swarms of chironomids and sciarids, feeding aggregations of nematoceran Diptera and cicadellids, and dispersal flights of aphids. *Atomosia puella* perched near concentrations and preyed repeatedly upon them for the duration of the concentration. For example, during a termite swarm, the ratio of termites to other prey increased as the swarm became larger and decreased as the swarm passed—0 vs. 12, 20 vs. 2, 34 vs. 2, 13 vs. 5, 3 vs. 8, 0. vs. 18 for termites and other prey from 1000 to 1500 h, respectively. Similarily, large numbers of major prey taxa appearing in the diet of *A. puella* corresponded to the time and existence of localized prey concentrations.

The following is a list of prey taken by *A. puella* at the study site. In some instances prey are presented only to order or family level since some prey were damaged, lost, or too numerous for identification. Each notation of prey refers to a single record unless followed by a number in parentheses. Also note that the month and year are recorded only once at the end of a series for each prey taxon. All prey are adults except for Araneida.

ARANEIDA: Unidentified immature 21(3).VI.77, 1.VII.78. ISOPTERA: Rhinotermitidae, *Reticulitermes flavipes* (Kollar) 19.20(70).28.VI.78. PSOCOPTERA: Caeciliidae, *Caecilius* sp. 5.23.VI.77, 26.VI.78; Ectopsocidae, *Ectopsocus* sp. 5.23.24.VI.78; Philotarsidae, *Aaronella* sp. 23.24.26.27.VI. 78, 1.VII.78. THYSANOPTERA: Unidentified 22(2).VI.77, 21(2).22(4). 27.30.VI.78. HEMIPTERA-HOMOPTERA: Anthocoridae, *Oris insidiosis* (Say) 30.VI.77, 25.27.30.VI.78, 1.VII.78; Aphididae, unidentifed 3(5).5(3). 21(2).22(6).30.VI.77, 1.VII.77, 17(4).19(7).20(5).21(15).22(13).23(13).25(9). 26(15).27(10).28(12).29(2).30(18).VI.78, 1(12).VII.78, Cicadellidae, *Aceratagallia sanguinolenta* (Prov.) 3.VI.77, 27.VI.78, *Agallia constricta* Van D. 22(2).VI.77, 20.29.VI.78, *Amblysellus curtisii* (Fitch) 30(2).VI.77, 19.28(2). VI.78, *Aphrodes flavostriatus* (Donovan) 24.VI.77, 21.VI.78, *Doratura stylata* (Boh.) 5.27.VI.77, 26.VI.78, *Empoasca fabae* (Harris) 3(3).VI.77, 19. VI.78, *E. erigeron* DeLong 5(3).26(4).VI.78, *Graminella nigrifrons* (Forbes) 30(2).VI.77, 27.28.VI.78, *Latalus sayi* (Fitch) 22(2).VI.77, 23.VI.78, *Laevicephalus sylvestris* (Osborn and Ball) 21(3).VI.77, 19(3). 22(2).24(3).VI.78, *Oncopsis verticis* (Say) 27(3).VI.77, 21(2).VI.78, 1.VII. 78, *Orientus ishidae* (Matsumura) 22(2).VI.77, 21.28.VI.78, *Osbornellus clarus* Beamer 22.VI.77, 1.VII.78, *Paraphlepsius irroratus* (Say) 27.VI.77, 1.VII.77, 17.VI.78, *Planicephalus flavocostatus* (Van D.) 23(3). VI.77, 25.27. VI.78, 1.VII.78, *Polyamia weedi* (Van D.), 21.22.VI.77, 1.VII.77, 26.27.VI. 78, *Scaphoideus immistus* (Say) 21(2).VI.77, 25(3).30(4).VI.78, *Scaphytopius acutus* (Say) 22(3).VI.77, 17(2).23(3).VI.78, 1.VII.78, *S. frontalis* (Van D.) 22(2).VI.77, 21.23.24.27(2).30(2).VI.78, *Streptanus aemulans* (Kirsch.) 22(2).VI.77, 21(3).22.VI.78, 1(2).VII.78, Typhlocybinae 3(3).VI.77, 22.23.26(4).VI.78, *Typhlocyba cassiopeia* Knull 22(2).VI.77, 23.24.28(2).VI. 78, *T. putmani* Knull 24(2).25(2).26.28.30.VI.78, *Xestocephalus pulicarius* Van D. 22.25(2).26.VI.78; Cixiidae, *Cixius* sp. 1.VII.78; Coccoidea, unidentified 21.VI.78; Delphacidae, *Stobaera tricarinata* (Say) 25.VI.78, *Pissonotus* sp. 27.VI.78, *Delphacodes lutuleuta* (Van D.) 1.VII.78; Miridae, *Megalocoleus molliculus* (Fallén) 5(2).30.VI.77, 21(2).22(2).23(5).24(3). 26(3).VI.78, 1(8).VII.78, *Plagiognathus* sp. 3.21(2).VI.77, 19(4).20(3).25(5). 26(6).27(4).28(4).29.30(3).VI.78, *Reuteroscopus orantus* (Reuter) 19(4). 20.25(4).27(3).28.30(2).VI.78; Psyllidae, unidentified 20.VI.78; Saldidae, *Saldula* sp. 20.24.VI.78, 1.VII.78. COLEOPTERA: Unidentified 3.VI.77, 17.20.21(3).22(3).23(2).26(2).28.30.VI.78, 1.VII.78; Anobiidae, *Petalium* sp. 21.24.VI.78; Anthicidae, *Anthicus* sp. 5.VI.77; Chrysomelidae, *Chaetocnema* sp. 26.28.VI.78; Hydrophilidae, *Cercyon* sp. 3.27.30.VI.77; Leptodiridae, unidentified 23.VI.78, 1.VII.78; Lyctidae, unidentified 21(2).VI.78;

Scolytidae, *Hypothenemus* spp. 5(3).VI.77, 19.21(2).22(2).23(9).25.26(2). 30(2).VI.78; Staphylinidae, unidentified 30.VI.77, 17.21(2).23.25.27.28(2). 30.VI.78, 1(2).VII.78. STREPSIPTERA: Stylopidae, *Pseudoxenos lugubris* (Pierce) 22.VI.77, 27.28.VI.78, 1.VII.78. DIPTERA: Unidentified 30.VI.77, 19.20.21(3).27.28(2).VI.78, 1.VII.78; Agromyzidae, *Agromyza* sp. 27(2). 28(2).V.78, *Cerodonta dorsalis* Loew 1.3(8).21(3).30(4).VI.77, 19(2).21(4). 27(4).28(6).29.30(3).VI.78, 1(2).VII.78, *C.* (*Poemyza*) *muscina* (Meigen) 22(4).24.27.VI.77, 20(2).25(4).VI.78, *Phytomyza* sp. 21.VI.77, 19(2).21(2). 25(2).26.27(2).28(6).29.VI.78; Anthomyiidae, *Mumetopia occipitalis* Mel. 3. VI.77, 19.21.27.VI.78; Anthomyzidae, unidentified 21.27(2).30.VI.78; Asilidae, *Apachekolas* sp. 26.VI.78; Cecidomyiidae, *Anarete* sp. 21.22.30.VI. 77, 20.22.23.25.VI.78, *Asteromyia* sp. 3(17).30(4).VI.77, 14(3).21(5).23(3). 25(10).27(5).28(3).30(6).VI.78, 1(15).VII.78, *Contaria* sp. 19.VI.78, *Dasineura* sp. 25(4).VI.78, *Hyperdiplosis* sp. 17.29.VI.78, *Lestermia* sp. 17.19(2).20.21.25(3).30.VI.78, *Micromya* sp. 22(3).VI.77, 19(3).22(3).24(2). 25(9).26.27(3).VI.78, 1(2).VII.78, *Neolasioptera* sp. 14.19.21.VI.78, 1(4). VII.78, *Porricondyla* sp. 24.VI.77, 25(2).27(2).VI.78, 1.VII.78, *Procystiphora* sp. 3.VI.77, 24.VI.78, *Resseliella* sp. 22.VI.77, 27.30.VI.78, *Winnertia* sp. 21.29.VI.78; Ceratopogonidae, *Atrichopogon levis* (Coq.) 3.27.VI. 77, 27(5).VI.78, *Culicoides paraensis* (Goeldi) 3.VI.77, 19.25.28.VI.78, 1(2). VII.78, *Dasyhelea* sp. 1(2).VII.78, *Forcipomyia* sp. 1(2).VII.78; Chironomidae, Orthocladiinae, unidentified 3(2).VI.77, 19(2).23(3).28.VI.78, *Anatopyinia* sp. 3.VI.77, 20(2).22(4).30(4).VI.78, *Chironomis* sp. 14.20.21.25(6). 27.28(2).VI.78, 1(4).VII.78, *Tanytarsus* sp. 21.24.26.VI.78, 1.VII.78; Chloropidae, *Chlorops* sp. 21(2).VI.78, *Conioscinella* sp. 22.23(4).30.VI.78, *Goniopsita catalpae* (Mall.) 19.22.26.VI.78, *Oscinella* sp. 21.VI.77, 22.27.28(4).VI.78, 1(3).VII.78, *O. frit* (L.) 21.VI.78, *O. carbonaria* (L.) 19.27(2).VI.78, 1.VII.78, *Siphonella nigripalpis* (Mall.) 14.28(3).VI.78, 1. VII.78, *Taumatomia bistriata* (Wlk.) 23(5).24(2).VI.78, 1.VII.78, *T. glabra* (Mg.) 14(2).VI.78, 1(2).VII.78; Chyromyiidae, unidentified 1.VII.78; Dolichopodidae, *Chrysotus* sp. 17.20(3).22.23(2).25(2).VI.78, *Gymnopternus debilis* Loew 24.VI.77, 27(2).28.29(2).30(2).VI.78, 1(2).VII.78; Drosophilidae, *Scaptomyza* sp. 27.VI.77, *S. pallida* (Zett.) 25.VI.78, *S. adusta* (Lw.) 30.VI.78, *S. wheeleri* Hackman 22.26.VI.78; Empididae, *Euhybus purpureus* Walker 22.23.VI.78; Ephydridae, *Leptopsylopa nigrimana* (Will.) 30. VI.77, 14.20.23.25(3).VI.78, 1(2).VII.78; Heleomyzidae, unidentified 3.22(4). VI.77, 21(3).23.27.28.29.VI.78, 1.VII.78; Lauxanidae, *Homoneura philadelphica* (Macq.) 21.22(2).28.VI.78, 1.VII.78; Phoridae, unidentified 27.VI. 78, *Asteromyia* sp. 27.VI.78, *Dorniphora* sp. 27.VI.78, *Megasilea* sp. 3(2). 5.21.22(4).24(3).30.VI.77, 19.21(4).22(2).23(2).24(3).25(2).26(3).27(3).28.30(3). VI.78, 1(9).VII.78; Phytomyzidae, unidentified 24.VI.77; Pipunculidae, *Chalarus* sp. 22.24.VI.77, 19.26.VI.78, 1.VII.78; Psychodidae, *Psychoda* sp. 3(5).22(6).27.30.VI.77, 21(5).23(4).24(2).25.26(6).27(5).28(3).30(3).VI.78, 1(6).VII.78; Scatopsidae, *Scatopsa* sp. 21.22.VI.77, 19.20(3).21(5).24.25(7). 27(12).28(6).VI.78, 1(8).VI.78, *S. fuscipes* Meigen 14.21(3).25(17).26.27(10). 28(27).VI.78, 1(17).VII.78; Sciaridae, *Bradysia* sp. 3(4).5.21.22(2).27.30(3). VI.77, 19(5).20(2).21(9).22(2).24(3).26(3).27(5).28.29.30.VI.78, 1(4).VII.78, *Sciaria* sp. 3(5).5.22.VI.77, 1(11).VII.77, 19(4).21.25.26.27(2).28(10).VI.78; Sepsidae, *Sepsis* sp. 3(3).20.21.24(2).27(2).30.VI.77, *S. punctum* (Fab.) 26.28(2).VI.78; Simulidae, unidentified 3(3).5.21.22(2).VI.77, 17.21.26.30. VI.78; Spheroceridae, *Sphaerocera vaporarium* Haliday 21.VI.77; Syrphidae, *Palpadus* sp. 30.VI.78; Tephrididae, unidentified 24.VI.77, 27.30.VI. 78; Tipulidae, unidentified 11.VI.77, 22.VI.78. LEPIDOPTERA: Gelechiidae, *Sitotroga ceratalla* (Oliver) 21.22.23.25(3).26.VI.78; Tingidae, *Tinea* sp. 1.VII.77, *Homoseta* sp. 17.24.VI.78. HYMENOPTERA: Aphidiidae, *Praon* sp. 21.VI.77; Braconidae, *Aphaereta* sp. 3(2).5.21(3).22.27(2).30.VI. 77, 19.20.21.23.24.25.27.28(3).29.30.VI.78, 1(2).VII.78, *A. pallipes* (Say) 3(5).5.21(5).22(3).30.VI.77, 17.19.21(5).22(3).23.24.25.26.27(2).28.29.30.VI. 78, 1(2).VII.78, *Aspilota* spp. 3(2).21.VI.77, 20.21.30.VI.78, *Chorebus* sp. 21.VI.77, 22(3).26(2).27.VI.78, 1.VII.78, *Euphoriella* spp. 27(2).VI.77, 1. VII.77, 23(2).24(2).26(2).27(2).29(2).30(3).VI.78, 1(4).VII.78, *Synaldis* sp. 28.VI.78; Ceraphronidae, *Ceraphron* sp. 27.VI.77, 22.VI.78, *Lygocerus* sp. 21.VI.77, 28(2).VI.78; Cynipidae, *Hexacola* sp. 21.27(2).28.VI.78; Diapriidae, *Trichopria* sp. 3.VI.77, 19.21.22.VI.78, 1.VII.78; Encytridae, *Oencyrtus* spp. 30.VI.77, 1.VII.77, 17.19.21(2).24.26.VI.78; Eulophidae, *Aphelinus* sp. 27.VI.77, 1.VII.77, 19.20.26.VI.78; Eupelmidae, unidentified 21.VI.78; Eurytomidae, *Eurytoma* sp. 21(2).23.24.26.VI.78; Formicidae, *Formica* sp. (winged reproductives) 3(2).30.VI.77, 23.30.VI.78, *Ponera pennsylvanica* Buckley 5(5).27(4).VI.77, 19.21.VI.78; Halictidae, unidentified 20.VI.77, 21. VI.78; Perilampidae, *Perilampus* sp. 27.VI.77, 20.21(3).24.25.29.VI.78; Pteromalidae, unidentified 3.22.VI.77, 20.21.29.VI.78; Scelionidae, *Gryon* sp. 27(3).VI.78, *Telenomus* sp. 26.VI.78, 1(3).VII.78.

Acknowledgments

We express our appreciation to the following taxonomists of the Systematic Entomology Laboratory, USDA, for identifying prey of *A. puella*: D. R. Smith, J. L. Herring, J. P. Kramer, A. S. Menke, B. D. Burks, P. M. Marsh, R. W. White, D. M. Anderson, R. E. Warner, J. M. Kingsolver, C. W. Sabrosky, G. C. Steyskal, F. C. Thompson, L. Knutson, and R. J. Gagné. Identifications also were provided by D. R. Davis and P. J. Spangler of the Department of Entomology, Smithsonian Institution; E. E. Mockford, Illinois State University; and W. B. Peck, Central Missouri State College. Dr. Erik Scully, Department of Biology, Towson State University, provided valuable assistance with the statistical analysis and read a preliminary draft of the manuscript. Dr. L. Knutson, Chairman, Insect Identification and Beneficial Insect Identification Institute, USDA, Beltsville, Maryland, examined a revised draft of the manuscript. We also thank Dr. E. G. Worthly, Environmental Biologist, Aberdeen Proving Grounds, Aberdeen, Maryland, for use of his farm.

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